

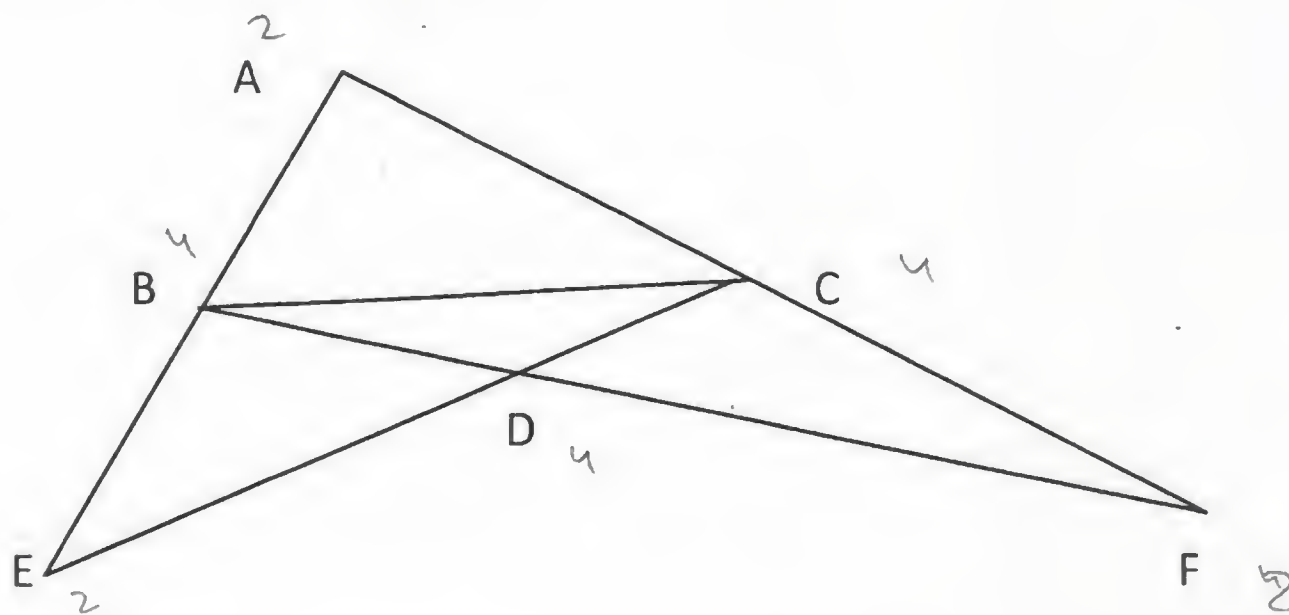
University of Bahrain
IT College of Information Technology
Department of computer science
ITCS253 Discrete Structures II
1st semester 2012-2013
Quiz # 1

10/10

ID:

Name:

Q1. Consider the following graph



a) Is the graph complete? Why?

2 No, there is no edge between A and D

b) Is the graph bipartite? Why?

2 No, because there is triangle ABC

c) Does the graph contain Euler circuit? Why?

yes, all vertices have even degree and the graph is connected.

d) Find the degrees of vertices E and D. Find a simple path of length 4 from A to F.

$\deg(E) = 2$, $\deg(D) = 4$

2 path of length 4 from A to F: A C B D F

e) Write V, E and edge-point function.

$V = \{A, B, C, D, E, F\}$

$E = \{\{A, B\}, \{A, C\}, \{B, C\}, \{B, D\}, \{C, D\}, \{C, F\}, \{B, E\}, \{D, F\}, \{D, E\}\}$



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(Section 1)
Quiz #2

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Q1. (10 marks) The adjacency matrix A of a graph is given below.

	a	b	c	d	e
a	0	0	1	1	0
b	0	0	1	1	0
c	1	1	0	1	0
d	1	1	1	0	1
e	0	0	0	1	1

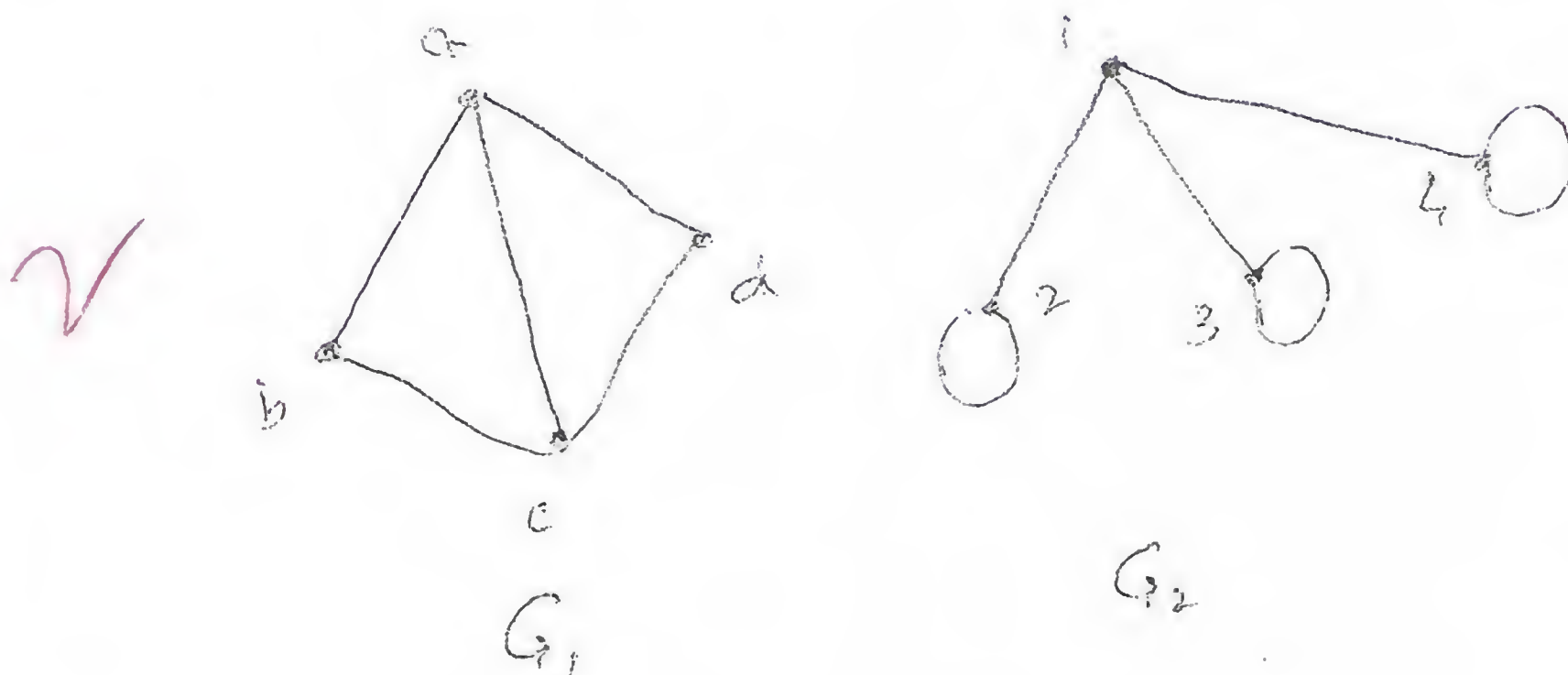
Without drawing the graph,

- ✓ a) Is the graph simple? Why. *No, vertex e has a loop (e,e)*
 ✓ b) Is the graph undirected? Why. *Yes, the matrix is symmetric*
 c) Find the degree of each vertex.
 d) Find the number of edges in the graph.

✓ c) $\deg(a) = 2$ $\deg(b) = 2$ $\deg(c) = 3$ $\deg(d) = 4$ $\deg(e) = 3$

d) ✓ 7 edges

Q2. Are the following pair of graphs isomorphic? Why



No, because number of edges are not equal
 $|E_1| = 5 \neq |E_2| = 6$

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Quiz #3

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Q1. (7.5marks) For the following statements about a **tree** T , mention which of them are true and which of them are false. Justify.

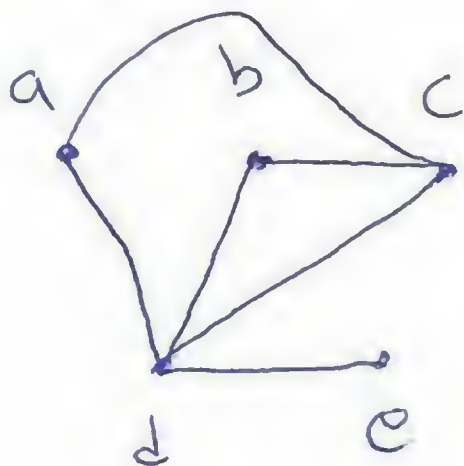
- a) There are many paths between any two vertices of a tree. **F** ✓
- b) A tree is connected and removal of a single edge does not disconnect it. **F** ✓
- c) Find the number of edges in tree with n number of vertices. **~~F~~ T** ✓
- d) There are m^h leaves in a complete full m -ary tree of height h . **T** ✓
- e) Number of leaf nodes in a completely filled m -array tree equals m^h . **T** ✓

7.5

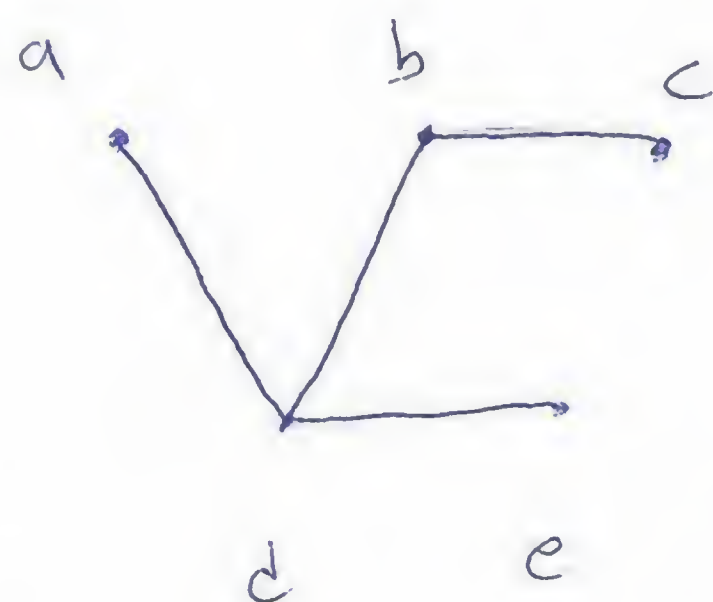
a) False, because if there are many paths between any two vertices, the graph may have cycles

b) false, if removal of a single edge does not disconnect a tree, then that edge make a cycle \Rightarrow the graph is not a tree (contradiction)

Q2. (2.5 marks) Draw a spanning trees of the graph the adjacency matrix A of which is given below.



	a	b	c	d	e
a	0	0	1	1	0
b	0	0	1	1	0
c	1	1	0	1	0
d	1	1	1	0	1
e	0	0	0	1	0



2.5

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Quiz #5

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Q1. (5 marks) Show that

$$C(n+1, r) = C(n, r-1) + C(n, r)$$

L.H.S:

$$\frac{n!}{(n-r+1)!(r-1)!} + \frac{n!}{(n-r)!r!}$$

$$\frac{n!}{(n-r+1)!(r-1)r!} + \frac{n!}{(n-r)!r!}$$

R.H.S:

$$\frac{(n+1)!}{(n+1-r)!r!}$$

Q2. (5 marks) Find number of words of length 3 using letters A, B, C and D in each of the following cases

- Repetition is allowed.
- Repetition is not allowed.

a)

4 4 4

$$\text{no. of words} = 4^3 = 4 \times 4 \times 4 = 16 \times 4 = 64$$

b)

$$\text{no. of words} = 4 \times 3 \times 2 = 12 \times 2 = 24$$